

## Gas Chromatographic: Mass Spectroscopic Analysis of Citrus reticulata Fruit Peel, Zingiber officinale Rhizome, and Sesamum indicum Seed Ethanolic Extracts Possessing Antioxidant Activity and Lipid Profile Effects

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**Abstract :** A variety of herbal medicinal plants are known to confer beneficial effects in regards to modification of cardiovascular risk factors. The anti-hypercholesterolaemic and antioxidant activities of the crude ethanolic extracts of Citrus reticulata fruit peel, Zingiber officinale rhizome and Sesamum indicum seed extracts have been demonstrated. These plants are assumed to possess biologically active principles, which impart their pharmacologic activities. GC-MS analysis of the ethanolic extracts was carried out to identify the active principles and their percentages of occurrence in the analytes. Analysis of the extracts was carried out using (GC-MS QP) type Shimadzu 2010 equipped with a capillary column RTX-50 (restec), (length 30mm, diameter 0.25mm, and thickness 0.25mm). Helium was used as a carrier gas, the temperature was programmed at 200°C for 5 minutes at a rate of 15ml/minute, and the extracts were injected using split injection mode. The identification of different components was achieved from their Mass Spectra and Retention time, compared with those in the NIST library. The results revealed the presence of 80 compounds in Sudanese locally grown C. reticulata fruit peel extract, most of which were monoterpenoid compounds including Limonene (3.03%), Alpha & Gamma - terpinenes (2.61%), Linalool (1.38%), Citral (1.72%) which are known to have profound antioxidant effects. The Sesquiterpenoids Humulene (0.26%) and Caryophyllene (1.97%) were also identified, the latter known to have profound anti-anxiety and anti-depressant activity in addition to the beneficiary effects in lipid regulation. The analysis of the locally grown S. indicum oily and water soluble portions of seed extract revealed the presence of a total of 64 compounds with considerably high percentage of the mono-unsaturated fatty acid ester methyl oleate (66.99%) in addition to methyl stearate (9.35%) and palmitate (15.71%) of oil portion, whereas, plant sterols including Gamma-sitosterol (13.5%), fucosterol (2.11%) and stigmasterol (1.95%) in addition to gamma-tocopherol (1.16%) were detected in extract water-soluble portion. The latter indicate various principles known to have valuable pharmacological benefits including antioxidant activities and beneficiary effects on intestinal cholesterol absorption and regulation of serum cholesterol levels. Z. officinale rhizome extract analysis revealed the presence of 93 compounds, the most abundant were alpha-zingiberone (16.5%), gingerol (9.25%), alpha-sesquiphellandrene (8.3%), zingerone (6.78%), beta-bisabolene (4.19%), alpha-farnesene (3.56%), ar-curcumene (3.29%), gamma-elemene (1.25%) and a variety of other compounds. The presence of these active principles reflected on the activity of the extract. Activity could be assigned to a single or a combination of two or more extract components. GC-MS analysis concluded the occurrence of compounds known to possess antioxidant activity and lipid profile effects.

**Keywords :** gas chromatography, indicum, officinale, reticulata

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